

WHAT IS CLAIMED IS:

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1. An erasing device for a liquid crystal display image, provided in a liquid crystal display device having a liquid crystal display panel whose pixels are driven by active elements, for erasing a display image on said liquid crystal display panel when a power source of a main body of said liquid crystal display device is turned OFF, comprising:

power source OFF detecting means for detecting an OFF signal that turns OFF the power source of the main body of said liquid crystal display device;

panel power maintaining means for supplying power to said liquid crystal display panel for a certain period when said power source OFF detecting means detects said OFF signal; and

erasing means for, when said power source OFF detecting means detects said OFF signal, lighting up said liquid crystal display panel entirely on a saturation voltage of liquid crystal and subsequently shutting off said liquid crystal display panel entirely using the power supplied by said panel power maintaining means.

2. The erasing device for a liquid crystal display image of Claim 1, wherein:

said power source OFF detecting means outputs a

power source OFF signal to said panel power maintaining means and said erasing means upon detection of said OFF signal;

said panel power maintaining means supplies the power to said liquid crystal display panel upon input of said power source OFF signal; and

said erasing means lights up and subsequently shuts off said liquid crystal display panel entirely upon input of said power source OFF signal.

3. The erasing device for a liquid crystal display image of Claim 2, wherein said erasing means shuts off said liquid crystal display panel entirely by applying a voltage which turns OFF said liquid crystal.

4. The erasing device for a liquid crystal display image of Claim 3, wherein said erasing means lights up said liquid crystal display panel entirely by outputting (1) a gate driving signal which sequentially turns ON gate lines of said liquid crystal display panel and (2) a first video signal which lights up said liquid crystal display panel entirely to source lines of said liquid crystal display panel, after which said erasing means outputs (3) the gate driving signal which sequentially turns ON the gate lines again, and (4) a second video

signal which shuts off said liquid crystal display panel entirely to the source lines.

5. The erasing device for a liquid crystal display image of Claim 4, wherein a time interval from when said liquid crystal display panel is lit up entirely and said liquid crystal display panel is shut off entirely is not shorter than one vertical period.

6. The erasing device for a liquid crystal display image of Claim 3, wherein said erasing means includes:

a driving signal generating circuit for, upon input of the power source OFF signal from said power source OFF detecting means, outputting an ON-level video signal which lights up said liquid crystal display panel entirely on the saturation voltage of said liquid crystal and subsequently an OFF-level video signal which shuts off said liquid crystal display panel entirely; and

a driver controller for outputting a synchronizing signal for driving a source driver and a gate driver in sync with each other based on one of the ON-level and OFF-level video signals outputted from said driving signal generating circuit, said driver controller also for outputting a gate driving signal which sequentially turns ON gate lines of said liquid crystal display panel

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to said gate driver,

said source driver outputting one of the ON-level and OFF-level video signals outputted from said driving signal generating means to source lines of said liquid crystal display panel based on the synchronizing signal outputted from said driver controller,

said gate driver outputting the gate driving signal outputted from said driver controller to the gate lines of said liquid crystal display panel.

7. The erasing device for a liquid crystal display image of Claim 3, wherein said erasing means includes:

a driving signal generating circuit for, upon input of the power source OFF signal from said power source OFF detecting means, outputting an ON-level video signal which lights up said liquid crystal display panel entirely on the saturation voltage of said liquid crystal and an OFF-level video signal which shuts off said liquid crystal display panel entirely;

a source side compensating means for, upon input of the power source OFF signal from said power source OFF detecting means, switching an input to a source driver from said driving signal generating circuit in such a manner that the ON-level video signal is inputted to said source driver for a predetermined period within one

vertical period followed by the OFF-level video signal;

a driver controller for outputting a synchronizing signal for driving said source driver and a gate driver in sync with each other based on said output from said driving signal generating circuit, said driver controller also for outputting a first gate driving signal which turns ON all gate lines of said liquid crystal display panel concurrently and a second gate driving signal which sequentially turns ON the gate lines to said gate driver; and

gate side compensating means for, upon input of the power source OFF signal from said power source OFF detecting means, switching an input to said gate driver from said driver controller in such a manner that the first gate driving signal is inputted within said predetermined period and the second driving signal is inputted in a following period,

said source driver outputting said input from said driving signal generating circuit to source lines of said liquid crystal display panel based on the synchronizing signal outputted from said driver controller,

said gate driver outputting said input from said driver controller to the gate lines of said liquid crystal panel.

8. The erasing device for a liquid crystal display image of Claim 3, wherein said erasing means includes:

a driving signal generating circuit for, upon input of the power source OFF signal from said power source OFF detecting means, outputting an ON-level video signal which lights up said liquid crystal display panel entirely on the saturation voltage of said liquid crystal and an OFF-level video signal which shuts off said liquid crystal display panel entirely;

a source side compensating means for, upon input of the power source OFF signal from said power source OFF detecting means, switching an input to a source driver from said driving signal generating circuit in such a manner that the ON-level video signal is input for a predetermined period within one vertical period followed by the OFF-level video signal;

a driver controller for outputting a synchronizing signal for driving said source driver and a gate driver in sync with each other based on one of the ON-level and OFF-level video signals outputted from said driving signal generating circuit, said driver controller also for outputting a gate driving signal for turning ON all gate lines of said liquid crystal display panel concurrently to said gate driver over said predetermined period,

said source driver outputting one of the ON-level and OFF-level video signals outputted from said driving signal generating circuit to source lines of said liquid crystal display panel based on said synchronizing signal outputted from said driver controller,

said gate driver outputting said gate driving signal outputted from said driver controller.

9. The erasing device for a liquid crystal display image of Claim 8, wherein said predetermined period is not longer than a vertical retrace line period within one vertical period.

10. The erasing device for a liquid crystal display image of Claim 8, wherein said driver controller keeps all the gate lines of said liquid crystal display panel turned ON for a period not longer than a vertical retrace line period within one vertical period.

11. The erasing device for a liquid crystal display image of Claim 7 further comprising video signal distributing means for distributing said output from said driving signal generating circuit to a plurality of mono-color video signals, wherein said source side compensating means is provided in an input side of said

video signal distributing means.

12. The erasing device for a liquid crystal display image of Claim 7 further comprising video signal distributing means for distributing said output from said driving signal generating means to a plurality of mono-color video signals, wherein said source side compensating means is provided in an output side of said video signal distributing means for each color.

13. The erasing device for a liquid crystal display image of Claim 1, wherein said panel power maintaining means accumulates power from the power source of the main body of said liquid crystal display device.

14. The erasing device for a liquid crystal display image of Claim 1, wherein said panel power maintaining means is capable of generating power.

15. The erasing device for a liquid crystal display image of Claim 2, wherein said power source OFF detecting means includes:

an input device through which a user inputs a command to said liquid crystal display device;

a detector for detecting whether a content of said

command inputted through said input device is to turn OFF the power source of the main body of said liquid crystal display device; and

power source OFF signal generating means for outputting the power source OFF signal to said panel power maintaining means and said erasing means when said detector detects that the content of said command is to turn OFF the power source of the main body of said liquid crystal display device.

16. The erasing device for a liquid crystal display image of Claim 2, wherein said power source OFF detecting means includes a voltage detector for detecting a voltage drop when an output voltage of the power source of the main body of said liquid crystal display device drops after the power source is turned OFF at a user's command, said voltage detector also for outputting the power source OFF signal upon detection of the voltage drop.

17. The erasing device for a liquid crystal display image of Claim 15, wherein said power source OFF detecting means includes power source OFF delaying means for, when said detector detects that the content of said command inputted through said input device is to turn OFF the power source of the main body of said liquid crystal

display device, turning OFF said power source after a certain period has passed, said power source being used as said panel power maintaining means.

18. An erasing device for a liquid crystal display image, provided in a liquid crystal display device having a liquid crystal display panel whose pixels are driven by active elements, for erasing a display image on said liquid crystal display panel when a power source of a main body of said liquid crystal display device is turned OFF, comprising:

power source OFF detecting means for detecting an OFF signal that turns OFF the main body of said liquid crystal display device;

panel power maintaining means for supplying power to said liquid crystal display panel for a certain period when said power source OFF detecting means detects said OFF signal; and

erasing means for shutting off said liquid crystal display panel entirely using the power supplied from said panel power maintaining means when said power source OFF detecting means detects said OFF signal.

19. The erasing device for a liquid crystal display image of Claim 18, wherein said erasing means shuts off

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said liquid crystal display panel entirely by applying a voltage which turns OFF liquid crystal.

20. The erasing device for a liquid crystal display image of Claim 18, wherein said erasing means shuts off said liquid crystal display panel entirely by making a video signal outputted to source lines of a pixel electrode of said liquid crystal display panel and an opposing electrode signal outputted to an opposing electrode of said liquid crystal display panel in phase at a same level.

21. The erasing device for a liquid crystal display image of Claim 19, wherein said erasing means outputs a gate driving signal which turns ON all gate signals of said liquid crystal panel concurrently, said erasing means also for outputting a video signal applied to a pixel electrode of said liquid crystal panel and an opposing electrode signal applied to an opposing electrode of said liquid crystal panel in such a manner that a voltage which turns OFF said liquid crystal is applied to said liquid crystal.

22. The erasing device for a liquid crystal display image of Claim 19, wherein said erasing means outputs a

gate driving signal which keeps all gate lines of said liquid crystal panel turned ON for a certain period, said erasing means also for outputting a video signal applied to a pixel electrode of said liquid crystal panel and an opposing electrode signal applied to an opposing electrode of said liquid crystal panel in such a manner that a voltage which turns OFF said liquid crystal is applied to said liquid crystal.

23. The erasing device for a liquid crystal display image of Claim 19, wherein said erasing means includes:

a source driver for outputting a video signal to source lines of said liquid crystal display panel;

a source driver control circuit for controlling said source driver;

an opposing electrode signal control circuit for outputting an opposing electrode signal to an opposing electrode of said liquid crystal display panel; and

a power source control circuit for driving said source driver control circuit to control said source driver to output a video signal to source lines of said liquid crystal display panel when said power source OFF detecting means detects said OFF signal, said video signal being in phase with an opposing electrode signal outputted to an opposing electrode of said liquid crystal

display panel and having a same voltage.

24. The erasing device for a liquid crystal display image of Claim 23, wherein said erasing means includes:

a gate driver for turning ON gate lines of said liquid crystal display panel; and

a gate driver control circuit for controlling said gate driver,

said power source control circuit driving said gate driver control circuit to control said gate driver to output a gate driving signal which turns ON all the gate lines of said liquid crystal display panel concurrently when said power source OFF detecting means detects said OFF signal.

25. The erasing device for a liquid crystal display image of Claim 24, wherein:

said gate driver control circuit outputs one of a first gate driving signal for sequentially turning ON the gate lines of said liquid crystal display panel and a second gate driving signal for turning ON all the gate lines concurrently to said gate driver;

said gate driver includes,

(a) a shift register having as many registers as the number of the gate lines of said liquid crystal display

panel for receiving and conveying said first gate driving signal to said each register,

(b) a level shifter having a level shift circuit for receiving said first gate driving signal outputted from said each register in said shift register and subsequently outputting said first gate driving signal after adjusting a level thereof, and

(c) a buffer circuit having an OR gate provided with two input terminals, an output signal outputted from each level shift circuit in said shift register being inputted to either input terminal, said second gate driving signal being inputted to the other input terminal,

said OR gate outputting said second gate driving signal to all the gate lines concurrently upon receipt of said second driving signal, said OR gate also outputting the output signal from said level shift circuit to the gate lines when said second gate driving signal is not received.

26. The erasing device for a liquid crystal display image of Claim 24, wherein:

said gate driver control circuit outputs one of a first gate driving signal for sequentially turning ON the gate lines of said liquid crystal display panel and a second gate driving signal for turning on all the gate

lines concurrently;

said gate driver includes,

(a) a shift register having as many registers as the gate lines of said liquid crystal display panel for receiving and conveying one of said first and second gate driving signals to said each register, and

(b) a level shifter for receiving said first gate driving signal outputted from said each register and subsequently outputting said first gate driving signal after adjusting a level thereof,

said shift register outputting a second gate driving signal from said each register upon receipt of said second gate driving signal, said shift register also outputting said first gate driving signal from said each register when said second gate driving signal is not received.

27. The erasing device for a liquid crystal display image of Claim 23, wherein said source driver control circuit includes:

a synchronized signal generating circuit for generating a video signal out of a horizontal synchronizing signal to be outputted, said video signal being in phase with an opposing electrode signal outputted to an opposing electrode of said liquid crystal

display panel and having a same voltage; and

a switching circuit for receiving both a normal video signal and the video signal outputted from said synchronized signal generating circuit, and subsequently outputting one of the normal video signal and the video signal outputted from said synchronized signal source generating circuit to said source driver.

28. The erasing device for a liquid crystal display image of Claim 24, wherein said gate driver control circuit, when controlling said gate driver to turn ON all the gate lines of said liquid crystal display panel concurrently, controls said gate driver to output a voltage signal driving said gate driver to all the gate lines concurrently.

29. The erasing device for a liquid crystal display image of Claim 18, wherein said power source OFF detecting means includes:

a judging switch for outputting a judging pulse when being pressed by a user; and

a power source OFF detecting circuit for detecting a command to turn OFF the power source of the main body of said liquid crystal display device upon input of said judging pulse while the main body of said liquid crystal

display device stays ON, and

wherein said panel power maintaining means includes a power source managing circuit for turning OFF a main power source of the main body of said liquid crystal display device after a predetermined period has passed since the input of said judging pulse while the main body of said liquid crystal display device stays ON.

30. A reflective liquid crystal display device for displaying an image by reflecting incident light from an external furnished with said display image erasing device set forth in Claim 1.

31. A reflective liquid crystal display device for displaying an image by reflecting incident light from an external furnished with said display image erasing device set forth in Claim 18.

32. A liquid crystal display device having a Guest-Host liquid crystal display panel furnished with said display image erasing device set forth in Claim 1.

33. A liquid crystal display device having a Guest-Host liquid crystal display panel furnished with said

display image erasing device set forth in Claim 18.

34. An erasing device for a liquid crystal display image, provided in a liquid crystal display device having a liquid crystal display panel whose pixels are driven by active elements, for erasing a display image on said liquid crystal display panel when a power source of a main body of said liquid crystal display device is turned OFF, comprising:

power source OFF detecting means for detecting whether the power source of the main body of said liquid crystal display device is turned OFF or not;

panel power maintaining means for supplying power to said liquid crystal display panel for a certain period after the power source of the main body of said liquid crystal display device is turned OFF; and

erasing means for lighting up said liquid crystal display panel entirely on a saturation voltage of liquid crystal and subsequently shutting off said liquid crystal display panel entirely using the power supplied from said panel power maintaining means source when said power source OFF detecting means detects that the power source of the main body of said liquid crystal display device is turned OFF.

35. The erasing device for a liquid crystal display image of Claim 34, wherein said erasing means drives said liquid crystal panel to apply a voltage which turns OFF said liquid crystal to said liquid crystal when turning OFF said liquid crystal display panel entirely after lighting up said liquid crystal display panel entirely.

36. The erasing device for a liquid crystal display image of Claim 35, wherein said erasing means outputs (1) a gate driving signal which sequentially turns ON gate lines to turn ON the active elements per gate line for a certain period not shorter than one vertical period by means of a gate driver and (2) a first video signal which lights up said liquid crystal display panel entirely by means of a source driver during said certain period, and after which said erasing means outputs (3) the gate driving signal which sequentially turns ON the gate lines to turn ON the active elements per gate line for said certain period not shorter than one vertical period by means of said gate driver again and (4) a second video signal which shuts off said liquid crystal display panel entirely by means of said source driver for said certain period.

37. The erasing device for a liquid crystal display image of Claim 35, wherein said erasing means includes:

a gate side compensating means for outputting a gate driving signal which turns ON the active elements on all gate lines concurrently in a vertical retrace line period within one vertical period by means of a gate driver; and

a source side compensating means for outputting a video signal which shuts off said liquid crystal display panel entirely by means of a source driver, said video signal being in sync with said gate driving signal outputted from said gate side compensating circuit,

said erasing means lighting up said liquid crystal display panel entirely during the vertical retrace line period.

38. The erasing device for a liquid crystal display image of Claim 35, wherein said erasing means includes:

gate side compensating means for outputting a gate driving signal which turns ON the active elements on all gate lines concurrently over a vertical retrace line period within one vertical period by means of a gate driver; and

source side compensating means for outputting a video signal which lights up and subsequently shuts off said liquid crystal display panel entirely by means of a

source driver, said video signal being in sync with said gate driving signal.

39. The erasing device for a liquid crystal display image of Claim 37 further comprising video signal distributing means for distributing a composite multi-color video signal into a plurality of mono-color video signals, wherein said source side compensating means is provided to an input side of said video signal distributing means for each color.

40. An erasing device for a liquid crystal display image, provided in a liquid crystal display device having a liquid crystal display panel whose pixels are driven by active elements, for erasing a display image on said liquid crystal display panel when a power source of a main body of said liquid crystal display device is turned OFF, comprising:

power source OFF detecting means for detecting whether the power source of the main body of said liquid crystal display device is turned OFF or not;

panel power maintaining means for supplying power to said liquid crystal display panel for a certain period after the power source of the main body of said liquid crystal display device is turned OFF; and

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erasing means for shutting off said liquid crystal display panel entirely by driving said liquid crystal display panel to apply a voltage which turns OFF said liquid crystal to said liquid crystal using the power supplied from said panel power maintaining means source when said power source OFF detecting means detects that the power source of the main body of said liquid crystal display device is turned OFF.

41. The erasing device for a liquid crystal display image of Claim 40, wherein said erasing means outputs a gate driving signal which turns ON gate lines sequentially to turn ON the active elements per line by means of a gate driver, said erasing means also outputting a video signal applied to pixel electrodes and an opposing electrode signal applied to an opposing electrode of said liquid crystal panel by means of a source driver and an opposing electrode signal control circuit, respectively, both said video signal and said opposing electrode signal being applied as said voltage which turns OFF said liquid crystal.

42. The erasing device for a liquid crystal display image of Claim 40, wherein said erasing means outputs a gate driving signal which turns ON the active elements on

all gate lines concurrently by means of a gate driver, said erasing means also outputting a video signal applied to a pixel electrode and an opposing electrode signal applied to an opposing electrode of said liquid crystal panel by means of a source driver and an opposing electrode signal control circuit, respectively, both said video signal and said opposing electrode signal being applied as said voltage which turns OFF said liquid crystal.

43. The erasing device for a liquid crystal display image of Claim 40, wherein said erasing means outputs a gate driving signal with a fixed power source potential supplied from a gate driver to all gate lines, said erasing means also outputting a video signal applied to image pixels and an opposing electrode signal applied to an opposing electrode of said liquid crystal panel by means of a source driver and an opposing electrode signal control circuit, respectively, both said video signal and opposing electrode signal being applied as said voltage which turns OFF said liquid crystal.

44. The erasing device for a liquid crystal display image of Claim 40, wherein:

a switch of the power source of the main body of

said liquid crystal display device outputs a judging pulse every time being manipulated;

said power source OFF detecting means detects that the power source of the main body of said liquid crystal display device is turned OFF upon input of said judging pulse while the main body of said liquid crystal display device stays ON; and

said panel power maintaining means turns OFF switch means after a predetermined period has passed since said power source detecting means detects that the power source is turned OFF, said switching means being provided on a main power source line for supplying power from a main power source of the main body of said liquid crystal display device.

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